

(3.9) Fuels

(3.9a) Existing Condition and Resource-Specific Information

Housing Density: The population in the vicinity of the Project Area is approximately 1,100 people. The housing density in these two Townships is approximately 28 houses per square mile (2000 US Census Data), with an average of 1.75 homes per 40 acres.

Fire Regimes: The current vegetation in the Project Area is characterized by three natural (historical) fire regimes (out of a total six fire regimes which occur within the HMNF). These include:

1. Fire Regime (FR) 1 represents landscape ecosystems historically experiencing frequent stand-replacing fires (HMNF 2006). These occur in the very dry outwash plains underlain by coarse-textured sandy soil. In the Project Area this would include jack pine/jack pine oak sands, pine barrens, and upland openings.
2. Fire Regime 2 represents landscape ecosystems historically experiencing large, catastrophic stand replacing fires at lower frequencies than those associated with FR1 (HMNF 2006). These occur on the outwash plains and ice contact landforms underlain with sandy and loamy sand soils. In the Project Area, this would include red and white pine and oak stands which can experience surface fires that periodically reduce the fine fuel loading, but do not kill the majority of trees.
3. Fire Regime 3 represents landscape ecosystems historically experiencing relatively infrequent stand-replacing fires, at much longer intervals than FR1 and FR2 but may experience frequent surface fires burning in the leaf layer. In the Project Area this would include aspen, hardwood, and lowland species (HMNF 2006).

Condition Classes: The Project Area is classified according to its condition class (CC), which is based on the departure from the historical fire regimes described above. Extensive areas of the HMNF are determined to be either CC2 (moderate departure from the historic fire regime), or CC3 (high departure from the historic fire regime).

The Project Area is considered to be in CC3. Condition Class 3 occurs where fire regimes have been altered from their historical range (Schmidt, et. al. 2002). Areas in CC3 are at a high risk of losing key components of the ecosystem and for experiencing increases in the size, intensity, and severity of wildland fires due to the increases in fuel build up and arrangement. In CC3, fires pose a relatively high risk to life and property, and the fire intensity is more severe, impacting large trees that would normally survive fires of lower intensity.

Condition Class 2 occurs where historical fire regimes have been moderately altered from their historical range (Schmidt, et. al. 2002). The negative aspects of being in a CC2 includes a moderate risk of losing key components of the ecosystem, an increase in fire size, intensity, and severity, and its effect on the landscape, although less so than CC3. This condition class is associated with moderate risk to life and property.

Condition Class 1 occurs where historical fire regimes are within their historical range and vegetation attributes are intact and functioning within a historical range (Schmidt, et. al. 2002).

One of the goals of the Forest Plan is to move areas that are in CC3 towards CC2 or, if possible, to CC1. This typically requires intensive vegetative treatments followed by the re-introduction of fire into the ecosystem utilizing prescribed burning. Where appropriate and reasonable, forested stands in CC2 would require moderate levels of treatment, with emphasis on the continued use of prescribed fire as a restoration and maintenance tool.

Table 3.28: Acreage and Percentage of Jack Pine and Red Pine-Dominated Stands On National Forest System Lands within the Project Area

Forest Type	Acreage	% of Total	Regime Class	Condition Class
Pine	1,896	11.3%	1	3
Pine/Oak	1,715	11.4%	2	3
Oak	7,206	48.0%	2	3
Aspen/HWD	3,245	21.6%	3	3
Open	1,150	7.6%	1	2
TOTAL	15,012			

Fuel Models: Forest fuels are classified into four basic groups. These are based largely on vegetation type and include: 1) grass, 2) brush, 3) timber, and 4) slash. The differences in fire behavior within these groups are related to the total fuel load and how it is distributed. Fuel loading and depth are measurable properties used for predicting the odds that a fire would be ignited under specific conditions, its rate of spread, and its intensity (Anderson 1982).

Fuel models (FM) found in the Project Area include Models 3, 4, 8, and 9; the majority of the area is comprised of FM8 and FM9 (89% of area). Smaller areas are represented by FM's 3 and 4 (11% of area). Fuel models 3 & 4 exhibit fairly active fire behavior and a greater possibility of a catastrophic wildfire than FM's 8 or 9. The distribution of the various fuel models can be found in Table 3.29. The representative fuel models are described in detail below (Anderson 1982).

Table 3.29: Fuel Models of Project Area

Forest Type	Fuel Model	Total Acreage	% Treated
Open	3	1,150	8
Jack Pine/JP-Oak	4	515	3
Pine/Pine Oak	9	2,896	20
Oak	9	7,206	47
Aspen/Hardwood	8	3,245	22
Total		15,012	

- **Fuel Model 3:** The primary carrier of fire is continuous coarse grass. Grass and shrub load is relatively light; fuelbed depth is about 2.5 feet. Shrubs are not present in significant quantities to affect fire behavior. Fires are surface fires that move rapidly through the cured grass and associated material. Annual and perennial grasses are

included in this model, and total fuel loadings are approximately 3.0 tons per acre. In the Project Area, FM 3 is currently represented by grass and forb-dominated openings and accounts for approximately 8% of the Project Area.

- **Fuel Model 4:** Fire intensity and fast-spreading fires involve the foliage and live and dead fine woody material in the crowns of a nearly continuous overstory. Stands of mature shrubs, 6 or more feet tall, and the closed jack pine stands of the north-central states are typical candidates. Besides flammable foliage, dead woody material in the stands contributes to the fire intensity. The height of stands qualifying for this model depends on local conditions. A deep litter layer may also hamper suppression efforts. Fuel loading is typically 16 tons per acre. In the Project Area, FM4 is represented by jack pine/jack pine-oak stands and accounts for approximately 3% of the Project Area.
- **Fuel Model 8:** Slow-burning ground fires with low flame lengths are typical, although the fire may encounter an occasional “jackpot” or heavy fuel concentration that can flare-up. Closed canopy stands of pine or hardwoods that have leafed out support fire in the compact litter layer. This layer is mainly needles, leaves, and twigs because little undergrowth is present. Fuel loading is typically 5 tons per acre. In the Project Area, FM8 is represented by aspen stands and accounts for approximately 22% of the Project Area.
- **Fuel Model 9:** Fires run through the surface a little faster than FM 8 and have longer flame heights. Both long-needle conifer stands and hardwood stands are typical. Fall fires in hardwoods are predictable, but high winds can actually cause higher rates of spread than predicted because of spotting caused by the rolling and blowing of burning leaves. Closed stands of long-needle pine, for example red pine, are grouped in this model. Concentrations of dead-down woody material will contribute to possible torching out of trees, spotting, and crowning. Fuel loading is typically 3.5 tons per acre. In the Project Area, FM9 is represented by red pine, red pine-oak, and hardwood-dominated stands and accounts for approximately 67% of the Project Area.

The fuel model descriptions described above include a figure for total fuel loading, given in tons per acre. That figure for fuel loading can be further broken down into four sub-categories based on the diameter of the fuel particles. Table 3.30 identifies the total fuel loading by subset:

Table 3.30: Fuel Loading Subsets

Fuel Model	Fuel Size – tons per acre				
	< ¼ inch	¼ to 1 inch	1 to 3 inch	Live	Total
3	3.0	0.0	0.0	0.0	3.0
4	5.0	4.0	2.0	5.0	16.0
8	1.5	1.0	2.5	0.0	5.0
9	2.9	0.4	0.2	0.0	3.5

While total fuel loading is an important factor affecting fire behavior, the fuel category that contributes to high-intensity crown fires is the live component. It is FM3 and FM4 represented by grasses, jack pine and jack pine-dominated stands respectively, that have a large amount of their fuel load in the needles of living trees, as well as overall fuel loading. These two fuel models account for approximately 11% of the Project Area. The smaller fuels, especially the <1/4 inch and the 1/4 inch to 1 inch categories, contribute the most to surface fire intensity.

High fuel loading in these smaller categories can cause a light to moderate intensity surface fire to trigger a high-intensity crown fire.

The activities proposed under Alternatives 2 and 3 would result in approximately 4,100 acres of initial prescribed burning. Some areas would likely be burned more than once over the course of the next ten years, based on the vegetative response and the desired future conditions of individual areas. The majority of the burning would be on a landscape level, burning a wide variety of stands in a contiguous burn block at one time. These blocks would range in size from 44 to 988 acres in size with the average size being approximately 450 acres. Because of logistical and biological constraints no more than ~2,000 acres of prescribed burning would be implemented annually, with the daily burn limitations being no more than what could be accomplished within one operational period (one day).

(3.9b) Area of Analysis

The Area of Analysis for the fuels projects is the Project Area (~26,000 acres). Of this, approximately 15,000 acres (58%) is in Forest Service ownership. The treatments affecting fuels would not extend beyond the Project Area boundary. The area is predominately rural in nature with farmland to the north and east and permanent homes and hunting camps inter-mixed throughout the area. This area of analysis would apply to the direct, indirect, and cumulative effects.

(3.9c) Direct and Indirect Effects

Alternative 1 proposes no new treatments to convert oak and pine forests to savanna; to thin, regenerate, or non-commercially treat aspen, pine, and oak stands; or to non-commercially enhance openings for TES, RFSS, and game species. Alternatives 2 and 3 propose to commercially or non-commercially harvest aspen, pine and oak cover types, and to manage non-forest types. Manual, mechanical, prescribed fire, and herbicide treatments to control certain woody and herbaceous species are included in Alternatives 2 and 3.

In Alternative 1, fuels would not be affected by prescribed fire and mechanical equipment treatments beyond the 343 acres of broadcast and pile burning described in the Savanna/Barrens Restoration Project. There would be no changes in the fuel condition classes in the Project Area and the Fuel Models would remain constant except for gradual changes caused by stand maturation and natural conversion. Fuel Models 3 and 4 would remain intact. The possibility of a large stand replacing wildfire would exist with this alternative.

In Alternatives 2 and 3, approximately 4,692 acres of varying types of fuels would be affected by prescribed fire and mechanical equipment treatments. This accounts for all areas receiving any type of treatment within the Project Area under this project and is in addition to the 343 acres of broadcast and pile burning implemented under the Savanna/Barrens Restoration Project. These treatments would change the condition class within the Project Area from a CC3 to a CC2 through the use of mechanical methods to make large-scale changes to the structure of the fuels, followed by a prescribed burning program that would simulate the natural fire regime as closely as possible. As time passed and mechanical and prescribed burns continued the CC2 stands would be converted into CC1. This would represent a better approximation of historical

fire regimes and vegetative attributes that are within their historical range (Schmidt, et. al. 2002).

There would be the conversion of the area from its present four Fuel Models to a more uniform area of 2, or possibly 3 Fuel Models. This would simplify the understanding of the area's fire behavior and therefore the ability to safely manage the burn program. There would be a continuum of open land blending into barrens and closed canopy woodlands along the river. Fuel Model 4, the most susceptible to catastrophic wildfire, would be treated and its volatility reduced.

Treatments in Alternatives 2 and 3 would modify the vegetative structure, amount, and continuity. Fire behavior would more likely be a surface fire than a crown fire. A surface fire would have shorter flame lengths and lower rates of spread than a crown fire, thereby providing more protection of life and property (Graham, McCaffrey, and Jain 2004).

(3.9d) Cumulative Effects

In Alternative 1, the forest would be unmanaged and there would be a slow succession to a closed canopy forest in this area. This would lead to an accumulation of dead and down standing wood, as well as an increase in ladder fuels, thus making the area susceptible to catastrophic stand replacing wildfires.

Alternatives 2 and 3 would move the area to a more open vegetative state that would allow easier access for future fire suppression if required. There would also be less likelihood of a catastrophic wildfire.

Since forested stands are dynamic systems, it is expected that the fuels in the Project Area would continue to be managed for decades. It is anticipated that additional treatments would need to be implemented in the same area as savanna and forested stands mature and as fuels continue to amass in the area as part of the natural succession of forests.